PROGRESS REPORTS

FROM

EXPERIMENT STATIONS

SEASON 1958-59

SURVEY OF REPORTS

PUBLISHED BY
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PROGRESS REPORTS FROM EXPERIMENT STATIONS. SEASONS 1958-59

A full list of reports published for the season 1958-59 is given below.

1. Uganda.
2. Kenya.
3. Tanganyika—Lake Province.
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5. Nyasaland.
6. Northern Nigeria.
7. Republic of the Sudan.
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9. West Indies.
10. Survey of Reports for 1958-59.

SURVEY OF PROGRESS REPORTS
FOR THE SEASON 1958-59

BY

H. E. KING

General

The progress reports submitted for the season 1958-59 cover work proceeding at twelve main stations and numerous sub-stations in which a total of some 40 officers of the Corporation have taken part. Although in most cases the reports deal only with the main features of the work, with the emphasis on the progress made, the collected volumes together constitute a formidable mass of information covering work on cotton in the fields of genetics, plant breeding, soil science, agronomy and plant physiology, entomology and plant pathology.

Moreover, although they are directed essentially to presenting the progress made in research on cotton, work on agricultural systems, and on crops other than cotton included in these systems, has been carried out and is touched on in a number of the reports.

The following brief survey can, therefore, do no more than draw attention to some only of what may be thought to be the more outstanding points, and indicate something of the range and nature of the detailed work described in the various sections of the individual reports, which must be referred to by the reader interested in particular branches of the work.

Taking the reports as a whole, it is at once clear that the division of the work into separate disciplines of genetics, plant physiology, entomology, and so forth is to some extent artificial. In the conditions under which most of the work is being carried out each worker is faced by unsolved problems in plant physiology, agronomy, climatology and crop husbandry, and until these have been tackled, and a farming system worked out which fits the local circumstances, the breeding of a particular variety of cotton and the development of a particular régime of insect pest control may be premature and inappropriate. Proper treatment of the soil and the best utilisation of the rainfall (or irrigation water) can result in conditions so different from those at present obtaining, in some territories at least, that plant breeding aims and the problems facing the entomologist are profoundly altered.

It is not surprising, therefore, that considerable sections of the reports are devoted to discussing the moisture requirements of the cotton crop and the means by which these can be met by varying planting date, changing plant population or modifying soil conditions by ridging, cross tying, mulching and other means. This holds for stations at which there is no formal provision for plant physiology or soil science and reflects the interests of all workers in the environment of the plants on which they are working.

It is, indeed, clear that studies of the crop environment promise more immediate and greater increases in yield than can be expected from plant breeding. An important feature of this work is that some at least of the results are likely to be applicable to crops other than cotton and could form the basis for spectacular yield increases in these also.

Plant Physiology and Agronomy

In studies which have covered some aspects of climatology, soil science and crop husbandry, as well as plant physiology, important additions to knowledge have emerged. Work at Namulonge on the seasonal distribution of rainfall and its effect on the developing crop has brought out the importance of time of onset of water stress. The pronounced effect of long dry periods on the yield of later planted cotton has emphasised once again the overriding importance of timely planting. Experiments at other stations, notably Serere, Ukiriguru and two "middle belt" stations in Northern Nigeria (Lowlands and Mokwa) have added further weight to this. Not only could production be increased immensely by the application of this finding to the whole of the commercial crop; until it is applied on a wide scale, the application of other methods of crop improvement is virtually ineffective.

In contrast to this tremendously marked planting date effect, the variation of plant population has been shown to be of minor importance. However, at Serere an additional 35 lb. lint per acre was obtained at a spacing of $1\frac{1}{2}$ ft. × 1 ft. compared with 3 ft. × 2 ft., and studies at Namulonge have led to the putting forward of a view that manipulation of plant populations and, through this, of time of attaining maximum leaf area, may prove a practicable means of fitting the crop to the expected rainfall distribution.

Trials in St. Vincent and Antigua also gave significant yield differences between different spacings. In these cases the plant population was varied both by changing the spacing between holes along the row and by thinning to one or to two plants per hole. The results obtained by these two methods suggest that they cannot be taken as alternative ways of obtaining the same effect. The drop in

yield which accompanied wider spacing was not eliminated when two plants were left at the wider spacing in comparison with thinning to one at the closer. Two plants per hole gave rather higher yields than one throughout a wide range of hole spacings, and on average this effect was at least as marked at the closer spacing as at the wider.

A further complication of this problem of varying plant population in practice is illustrated in the Serere report. Varying the spacing along a row with the rows at constant distance apart did not appear to have the same effect as varying the spacing between rows. For this reason further study is desirable of the conditions under which ridging is markedly advantageous and of the optimum size of such ridges together with the extent to which the practical requirements in making ridges limit the way in which plant populations may be varied. The cross tying of ridges and the optimum size of the reservoirs so formed are likewise considerations not to be overlooked in this connection.

Trials are reported from Serere and Makanga of ridges versus flat cultivation and from Makanga and Samaru of open furrows versus tied ridges. At Namulonge and Ukiriguru, on the other hand, cross tied ridges have been adopted as standard. Ridge spacing is 3 ft. at Namulonge and 5 ft. (with two rows of plants per ridge) at Ukiriguru, while in St. Vincent and Antigua a 4 ft. ridge is standard.

Tying of ridges (in the absence of mulching) is reported to have more than doubled the yield of groundnuts at Makanga. With cotton at Samaru an increase of 20% was recorded.

In comparisons of flat cultivation with ridging at five sites in the Serere area early planted cotton on ridges gave seed cotton yields averaging 90 lb. more than cotton on the flat, but with planting delayed 3 months (and overall yields in consequence greatly reduced), the difference averaged 50 lb. in favour of flat cultivation.

At Makanga ridging (without cross-tying and in the absence of a mulch) gave an increase of 75 lb. per acre in the yield of shelled groundnuts.

The introduction of cross ties between ridges was again shown to be capable of giving very substantial returns with cotton at Samaru and with groundnuts at Makanga, a 22% increase (a yield of 878 lb. per acre against 720 lb.) for seed cotton and a 91% increase (531 lb. of shelled nuts against 278 lb.) for groundnuts. In circumstances such as these, it is clear that the full value of ridging is realised only if the ridges are cross tied, the yield improvement being primarily a response to the efficiency of this form of cultivation as a water conservation measure.

Mulching with straw or dead grass, as an alternative to cross tying of ridges, tested at both Makanga and Samaru gave evidence that

increases in yield of the same order can be obtained by either practice, but that the use of mulch as an addition to ridging and cross tying does not give a substantial improvement over either measure used alone. It would seem that the action of mulching is primarily the same as that of cross tying, preventing runoff and hence conserving rainfall.

The use of rice husks as a mulching material is reported from Kenya and was found to give a substantial increase in yield. It was significantly more effective than maize stover and grass and, in this respect, appears to be comparable with groundnut shells as used in Northern Nigeria. Both are persistent and resistant to destruction by termites.

Trials of rotations of crops and of interplanting are reported from a number of stations, but do not on the whole lend themselves to brief summary; the problems involved are to a considerable extent peculiar to the individual territories. In view, however, of the widespread preference of the African peasant for intercropping, the results of trials at Makanga, in which maize and cotton were intercropped, are of outstanding interest. The yield figures obtained for the two crops are set out below.

NYASALAND: INTERPLANTING OF COTTON AND MAIZE

	Combined yields in lb. from 2 acres. Seed cotton + shelled maize.		
Cotton and maize planted 18 Dec. 1958			
1 acre pure stand of each	959	+	2904
2 acres interplanted	1237	+	3755
Cotton planted 6 Jan. 1959: maize 18 Dec. 1958			
1 acre pure stand of each	905	+	2931
2 acres interplanted	1032	+	3728
S.E.	±39·9		±137·7

It is clear that, if results of this nature can be obtained consistently, a strong case can be made out for encouraging the practice of this particular form of interculture, provided it has no foreseeable ill effects of consequence. One such effect which might well rule out the practice in some territories (and has indeed done so in Nyasaland in the past) is the retarding of the development of the cotton plants, and hence increasing the carryover of red bollworm. In some territories, however, (those in which the preparation of land for cotton often waits until the food crop is in, up and hoed), permission to interplant could result in the cotton going in sufficiently earlier to more than counter any reduction in rate of development. In some circumstances, also, the possible build-up of *Heliothis,* and also perhaps of mirids, would need consideration.

Trials with the same two crops in Antigua gave figures more in keeping with the general experience that intercropping, judged in terms of yield per acre, is not a profitable practice. The maize yields in particular were greatly depressed. Results from St. Vincent, however, appear to give some support to the Makanga experiment in suggesting that two acres of land interplanted with cotton and early maize would be more profitable than two acres divided and planted one acre to each crop in pure stand.

The yields reported from St. Vincent were, for two acres intercropped, 580 lb. cotton lint and 4,234 lb. of maize cobs and, for one acre of each crop grown separately, 408 lb. cotton lint and 3,401 lb. of maize cobs. These yields, however, were from wide spaced cotton in each case; where maize was not planted, no additional cotton plants took its place. It is probable, therefore, that the yield obtained from the cotton in pure stand was not the maximum for the conditions.

Trials of fertilizer applications are reported from several stations. With the widely different soils and climates, similar responses are not to be expected throughout, but it is noteworthy that very substantial responses are reported in some cases, and that these are the result of using the appropriate combination of nutrients on timely planted crops grown under conditions of adequate water supply and protection against insects. At Samaru, for instance, a yield of 2,246 lb. of seed cotton per acre was obtained with applications of sulphate of ammonia and superphosphate in addition to a substantial dressing of night-soil compost. This yield level is almost ten times that of the "ordinary" unmanured crop of the farm and represents a response obtainable only under conditions of efficient rainfall conservation and effective insect control. Under customary local conditions responses to fertilizers are erratic and generally disappointingly low.

Yields from randomly selected peasant plots in St. Vincent receiving various quantities of an NPK mixture showed a marked response. The N content of the mixture appeared to be mainly responsible.

Increases in yield with applications of nitrogen (sulphate of ammonia and urea) were recorded at Ukiriguru, but with reduced response to the higher levels for which the difficult season (severe drought periods) may have been responsible. In the Aden Protectorate also a substantial response was obtained to sulphate of ammonia.

Trials reported from Eastern Tanganyika indicate that there phosphate may be a limiting factor in some areas, and in an experiment protected by weekly applications of insecticide, a substantial response was obtained from an application at planting of 75 lb. per acre, whether or not this was accompanied by applications of sulphate of ammonia or farmyard manure, the latter being without effect in this experiment.

Genetics and Plant Breeding

Genetic studies at Shambat covering resistance to bacterial blight and jassid have resulted in additions to the body of knowledge on these subjects, but unfortunately this additional knowledge has not made the progress to a practical solution simpler. On the contrary, it is now clear that resistance to bacterial blight and its assessment in any given variety are far more complex matters than appeared a few years ago, while the production of strains of high quality cottons with adequate jassid resistance and without increased susceptibility to aphis infestation seems likely to prove a more formidable task than was at one time thought.

The continued reports from Namulonge and other stations of the persistence of genetic variability in current breeding material is noteworthy. Besides being of considerable interest academically this continuing, and in some cases even apparently increasing, variability constitutes the justification for continuing to practise the currently employed methods of straight reselection as the main line of breeding work in preference to elaborate hybridization programmes. When safeguarded by the employment of precise methods of measuring and evaluating statistically the advances obtained year by year this has obvious advantages.

The recent successes of the Namulonge strains of BP52 in Toro, Uk58 in Lake Province and Il58 in Eastern Province of Tanganyika are indicative of the effectiveness of current breeding methods in these territories, while in Northern Nigeria reselection work on the successful Samaru 26J strain has shown that substantially higher yielding strains can be bred from it by current methods.

Nevertheless, several stations are producing new material by hybridization as a subsidiary line of work to provide an alternative source to which to turn if the current material should be found lacking in some desired characteristic. In particular, crosses aimed at increasing the potential for bacterial blight resistance are being handled at several stations. It is of interest to note in this connection the widespread use made of the Albar material derived from commercial Nigerian Allen stocks of 1947-1949.

The isolation and multiplication for commercial growth in Nyasaland of the strain Albar 637 at Makanga is also particularly noteworthy. In Nigeria itself the Albar material has not given rise to anything able to compete with Samaru 26C which was bred from a much earlier isolation from the Allen stock grown in Nigeria from seed recorded as having been originally obtained from East Africa.

In the Sudan and the Aden Protectorate plant breeding work is at present complicated by the problem of what type of cotton is likely to be needed in the future. Since the decision may involve a switch

from one species of *Gossypium* to another (or even perhaps the attempt to grow two species simultaneously in the same part of the country) much testing is needed in both the field and laboratory to assess yielding power and saleability of a wide range of types before specific breeding work can be concentrated on any one.

Plant Pathology

The problems associated with protecting the current commercially grown strains of cotton in the various territories, none of which is sufficiently resistant to escape all damage from bacterial blight, have occupied much attention. The results of comprehensive tests of a wide range of seed disinfectants are reported from Namulonge, Serere and Ukiriguru. These in general support the previous findings that organic mercurials carefully applied at high rates can give almost complete disinfection and that no alternative (non-organic or non-mercurial) compound so far tried gives such consistently good results.

The discovery that *Lygus vosseleri* can disseminate *Xanthomonas malvacearum,* reported from Namulonge, is of potential importance for areas where *Lygus* is prevalent. From Antigua for the second season there is a report that the insect *Nezara viridula* also is under suspicion in connection with the infection of bolls.

Careful survey of the incidence of wilt associated with *Fusarium* in parts of Lake Province of Tanganyika has resulted in the conclusion that the spread of this disease is at present slow and does not warrant a full scale programme of breeding for resistance.

Studies of Abyan root rot suggest that there is a very close connection between this disorder and the amount and salt content of the soil water.

Entomology

Experiments reported from Uganda indicate that frequent applications of DDT are needed for effective control of insects. At Kigumba 8 and 10 applications gave a very substantial increase in yield (1,380 lb. against 1,069 lb. seed cotton from unsprayed control —an increase of 29%), while 6 applications (yield 1,303 lb.) were less effective and 4 applications (yield 1,254 lb.) still less. With the more frequent applications a low rate ($\frac{1}{2}$ lb. DDT per acre) was as effective as higher rates. Trials at Samaru and Daudawa and at stations in the Riverain Areas (or "middle belt") in Northern Nigeria, where insect pest damage is generally much higher, likewise showed that very substantial returns could be obtained by repeatedly spraying cotton which had been early planted and well treated.

From Kenya also results of spraying with DDT show economic increases with early planted plots.

An interesting comparison of a range of insecticides is reported from Antigua: marked differences in the degree of control of specific pests were observed but yields did not differ correspondingly, there being notably more shedding due to other causes in those plots where shedding caused by insects was reduced.

At El Kod in the Aden Protectorate an isolated plot of cotton exposed to extremely heavy infestation by *Diparopsis* gave a remarkable response to spraying with endrin. The unsprayed area was a virtual failure while that receiving endrin at weekly intervals was kept substantially free from *Diparopsis* and gave ten times the yield.

Such heavy infestation is, however, not usual in the Abyan area as a whole; the percentage of damaged bolls has been found not to exceed 5% until February when much of the crop has already matured.

It is reported from Kenya that the effect on stainer populations of confining chickens on cotton plots was to reduce the numbers of stainers and the proportion of stained lint but not to give any observable increase in total yield.

COTTON PRODUCTION

(in bales of 400 lb.)

	Record Crops		*Recent Crops*		
	Season	*Amount*	*1956-57*	*1957-58*	*1958-59*
Uganda	1937-38	417,179	372,433	350,972	400,962
Kenya	1936-37	22,166	8,182	11,547	17,378
Tanganyika	1958-59	*201,093*	169,061	171,433	*201,093*
Nyasaland	1934-35	21,006	7,000	9,180	15,649
*Nigeria	1957-58	240,861	143,431	240,861	176,018
Sudan	1956-57	704,645	704,645	272,728	691,003
Aden	1955-56	30,700	28,310	28,752	18,806
West Indies	1940-41	9,312	3,739	6,938	4,338
Total	1958-59	*1,525,247*	1,436,801	1,092,411	*1,525,247*

5-Year Averages.

	1921-22 to 1925-26	*1926-27 to 1930-31*	*1931-32 to 1935-36*	*1936-37 to 1940-41*	*1941-42 to 1945-46*	*1946-47 to 1950-51*	*1951-52 to 1955-56*
Uganda	128,300	159,100	271,700	345,000	208,300	295,800	352,300
Kenya	1,500	1,300	7,400	15,600	6,800	8,300	14,400
Tanganyika	16,600	22,200	42,700	61,700	39,100	48,400	97,300
Nyasaland	5,800	5,300	11,200	9,600	9,100	8,100	12,100
*Nigeria	28,900	28,600	35,500	45,400	29,100	49,100	138,900
Sudan	53,200	142,700	214,800	321,500	297,700	357,200	460,400
Aden	—	—	—	—	—	3,800	18,400
West Indies	4,800	5,200	3,600	6,800	4,800	4,900	5,100
Total	239,100	364,400	586,900	805,600	594,900	775,600	1,098,900

Figures in italics are estimates.

*Ginnery figures, not including amounts used for hand spinning.

COTTON PLANTING AND PICKING DATES

	Planting	*Picking*
Uganda	June-August	December-March
Kenya	May-August	December-February
Tanganyika:		
Lake Province	November-January	April-August
Eastern Province	February-April	July-October
Nyasaland:		
Southern and Central Provinces	December-January	June-July
Northern Province	May-June	November-December
Northern Nigeria	June-August	November-February
Sudan:		
Irrigated	August-September	January-May
Raingrown	June-August	October-February
Aden	August-October	February-May
West Indies	August-October	January-April

YIELDS OF LINT PER ACRE

The figures shown below have been included to give some idea of the yields obtained from cotton grown in different territories and under different conditions. Only those countries which publish official acreage figures have been included.

When looking at the figures it should be borne in mind that in most territories in Africa cotton is grown by peasant cultivators on small and scattered holdings, and is sometimes interplanted with other crops. In these circumstances accurate estimates of the area planted to cotton are very difficult to obtain, and this naturally makes it difficult to arrive at the true yield per acre.

YIELDS OF LINT IN POUNDS PER ACRE.

	Average 1935-36 to 1938-39	*1954-55*	*1955-56*	*1956-57*	*1957-58*	*1958-59*
Uganda—Raingrown	94	69	91	94	86	80
Kenya (Nyanza) ,,	—	60	62	53	47	64
Nyasaland ,,	48	110	51	103	105	173
West Indies. S.I. ,,	122	176	195	153	205	163
Sudan:						
American ,,	75	112	132	93	141	92
Sakel—Flood	203	125	248	103	145	152
Gravity and pump	430	434	469	584	152	435
Aden, Abyan—Flood	—	220	350	227	233	286
Lahej ,,	—	360	592	457	320	551

EMPIRE COTTON GROWING CORPORATION

12 CHANTREY HOUSE, ECCLESTON STREET, S.W.1.

PUBLICATIONS

EMPIRE COTTON GROWING REVIEW.

" The Empire Cotton Growing Review " is the official organ of the Empire Cotton Growing Corporation. It is published quarterly (in January, April, July and October) and contains original articles, notes on scientific, commercial and technical literature, and specialized advertisements. The price of each issue is **5s. 0d.**

PROGRESS REPORTS FROM EXPERIMENT STATIONS.

The reports for the seasons up to and including 1950-51 were published in seasonal volumes; the following are still in print and available at 3/- per volume.

1923-25 (one volume), 1926-27, 1931-32, 1934-35, 1935-36, 1942-43, and 1945-46 to 1950-51.

From 1951-52 the reports from each territory were published individually each season. A few of the 1951-52 reports are out of print, but all others are available at **1s.** per report or **7s. 6d.** for the seasonal set.

ANNUAL REPORTS.

The Annual Reports of the Corporation and booklets describing its work are available on application, free of charge.

BOOKS.

The Insect Pests of Cotton in Tropical Africa. E. O. Pearson. 1958. Obtainable from Commonwealth Institute of Entomology, price **40s.** (Joint publication E.C.G.C. and C.I.E.)

The Application of Genetics to Cotton Improvement. Sir Joseph Hutchinson. 1959. Obtainable from Cambridge University Press, price **15s.** (Joint publication E.C.G.C. and C.U.P.)

RESEARCH MEMOIRS.

This series comprises reprints of major scientific papers published by the staff of the Corporation since the war, as listed below. All except those marked with an asterisk as out of print are available at **2s. 6d.** each.

* **No. 1.** Breeding Cotton Resistant to Blackarm Disease. R. L. Knight. 1946.

* **No. 2.** Notes on the Classification and Distribution of Genera related to *Gossypium*. J. B. Hutchinson. 1947.

* **No. 3.** The Rôle of Major Genes in the Evolution of Economic Characters. R. L. Knight. 1948.

* **No. 4.** The Development of Internal Boll Disease of Cotton in Relation to Time of Infection. E. O. Pearson. 1948.

* **No. 5.** Observations on the Development of the Cotton Boll, with Particular Reference to Changes in Susceptibility to Pests and Diseases. R. C. Rainey. 1948.

No. 6. Experimental Methods with Cotton.—Sulphuric Acid Treatment of Cotton Seeds. Effects of Gap-filling on Development and Yield. D. MacDonald, W. L. Fielding and D. F. Ruston. Ginning Percentage and its Determination in Variety Trials. Determination of Staple Length in Single Plant Selections and Variety Trials. W. L. Fielding. 1948.

LIST OF PUBLICATIONS

No. 7. Jassid Resistance and Hairiness of the Cotton Plant. F. R. Parnell, H. E. King and D. F. Ruston. 1949.

No. 8. Response of Cotton to Leaf-Curl Disease. J. B. Hutchinson, R. L. Knight and E. O. Pearson. 1950.

No. 9. Confidence Limits of Expected Monthly Rainfall. H. L. Manning. 1951.

No. 10. The Distribution of Wild Species of *Gossypium* in the Sudan. R. L. Knight. The Cytological Relationships of *Gossypium somalense:* Gürke. H. Douwes. 1951.

No. 11. The Evolution of Blackarm Resistance in Cotton. R. L. Knight and J. B. Hutchinson. 1951.

No. 12. Intra-Specific Differentiation in *Gossypium hirsutum.* J. B. Hutchinson. 1951.

No. 13. The Genetics of Withering or Deciduous Bracteoles in Cotton. R. L. Knight. Colchicine Treatment of Young Cotton Seedlings as a Means of Inducing Polyploidy. H. Douwes. 1952.

No. 14. The Genetics of Jassid Resistance in Cotton. I. The Genes H_1 and H_2. R. L. Knight. 1952.

No. 15. Bacterial Blight of Cotton. G. M. Wickens. 1953.

No. 16. The Cytological Relationships of *Gossypium areysianum* Deflers. H. Douwes. 1953.

No. 17. (a) A Cotton Stainer (*Dysdercus superstitiosus* Fabr.) as a Potential Pest of Sorghum. (b) Studies of *Lygus vosseleri* Popp. (Heteroptera, Miridae). A Pest of Cultivated Cotton in East and Central Africa. (c) The Sorghum Midge, *Contarinia sorghicola* (Coq.), in East Africa. Q. A. Geering. 1953.

No. 18. The Genetics of Jassid Resistance in Cotton. II. Pubescent T611. III. The Kapas Purao, Kawanda *punctatum* and Philippines Ferguson Group. IV. Transference of Hairiness from *Gossypium herbaceum* to *G. barbadense.* R. L. Knight and J. Sadd. 1954.

No. 19. New Evidence on the Origin of the Old World Cottons. J. B. Hutchinson. 1954.

No. 20. The Biology of Red Bollworm, *Diparopsis watersi* (Roths.), in Northern Nigeria. Q. A. Geering and A. F. H. Baillie. 1955.

No. 21. Cotton Breeding in the Sudan. R. L. Knight. 1955.

No. 22. Botanical Studies in Cotton Quality. J. P. Evenson. 1956.

No. 23. The Statistical Assessment of Rainfall Probability and its Application in Uganda Agriculture. H. L. Manning. 1956.

No. 24. Vascular Infection of Cotton by *Xanthomonas malvacearum* (E. F. Smith) Dowson. G. M. Wickens. 1956.

No. 25. On the Estimation of Water Losses by Evaporation under Equatorial Conditions. Sir Joseph Hutchinson and H. G. Farbrother. 1956.

No. 26. Yield Improvement from a Selection Index Technique with Cotton. H. L. Manning. 1957.

No. 27. On an Electrical Resistance Technique for the Study of Soil Moisture Problems in the Field. H. G. Farbrother and L. E. Harrisson. 1957.

No. 28. Studies of Crop Loss following Insect Attack on Cotton in East Africa. K. S. McKinlay, Q. A. Geering and T. H. Coaker. 1958.

No. 29. Treatment of Cotton Seed against Bacterial Blight (*Xanthomonas malvacearum* (E. F. Smith) Dowson). G. M. Wickens. 1958.

No. 30. On the Characterization of Tropical Rainstorms in Relation to Runoff and Percolation. Sir Joseph Hutchinson, H. L. Manning and H. G. Farbrother. 1958.

LIST OF PUBLICATIONS

No. 31. Bacterial Boll Rot of Cotton (*Xanthomonas malvacearum* (E. F. Smith) Dowson). I. A Comparison of Two Inoculation Techniques for the Assessment of Host Resistance. C. Logan. 1958.

No. 32. Some Effects of Feeding by *Lygus vosseleri* Popp. (Heteroptera, Miridae) on the Stem Apex of the Cotton Plant. J. E. Dale and T. H. Coaker. 1958.

No. 33. Crop Water Requirements of Cotton. Sir Joseph Hutchinson, H. L. Manning and H. G. Farbrother. 1959.

No. 34. Studies in Wild Species of Cotton. 1. Variation within *Gossypium anomalum*. J. H. Saunders. 1959.

No. 35. Cotton Research and the Development of the Commercial Crop in the Sudan. M. F. Rose. 1960.

No. 36. Investigations on *Heliothis armigera* (Hb.) in Uganda. T. H. Coaker. 1960.

No. 37. The Use of a Selection Index Technique in the Analysis of Progeny Row Data. J. T. Walker. 1960.

No. 38. Some Effects of the Continuous Removal of Floral Buds on the Growth of the Cotton Plant. J. E. Dale. 1960.

No. 39. The Effects of Different Plant Foods on the Fecundity, Fertility and Development of a Cotton Stainer, *Dysdercus superstitiosus* (F.). Q. A. Geering and T. H. Coaker. 1960.

No. 40. Intraseasonal Variation in Boll Characters in African Upland Cotton. J. P. Evenson. 1960.

MISCELLANEOUS.

A very large number of papers written in whole or part by members of the staff have not been reprinted as Memoirs, and are not in general available for sale. A complete list of such papers published in the last few years is printed below.

1955.

Dark, S. O. S. "Hormone treatment to prevent shedding of breeding cotton bolls". Empire Cotton Growing Review, Vol. 32, No. 4, p. 277.

Ducker, H. C. "Cotton research in Nyasaland, 1954-55 season". Nyasaland Farmer and Forester, Vol. 3, No. 1, p. 41.

Farbrother, H. G. "A simple device for assessing the moisture content of grain". Empire Cotton Growing Review, Vol. 32, No. 4, p. 281.

Hutchinson, J. B. "I like America". Empire Cotton Growing Review, Vol. 32, No. 1, p. 37.

Hutchinson, J. B. "Observations in the American cotton belt". Empire Cotton Growing Review, Vol. 32, No. 2, p. 78.

Hutchinson, J. B. "Sources of gene material for cotton improvement". Empire Cotton Growing Review, Vol. 32, No. 2, p. 102.

King, H. E. "Seed replacement in Northern Nigeria". Empire Cotton Growing Review, Vol. 32, No. 3, p. 190.

Lawes, D. A. "A note on the effect of 2.4-D weedkiller on cotton" (with a drawing by J. H. Saunders). Empire Cotton Growing Review, Vol. 32, No. 4, p. 274.

Low, A. "A selfing technique especially suitable for raingrown cotton". Empire Cotton Growing Review, Vol. 32, No. 3, p. 222.

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